Rhubarb

ATLANTIC PROVINCES VEGETABLE CROPS GUIDE TO PEST MANAGEMENT 2002 - 2003

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Table of contents:

Introduction
Crop Establishment
Crop Management
Nutrition
Pests and Pest Control
Harvesting and Handling
Storage and Conditioning
Bibliography
Weeds
Insects
Diseases
Print as PDF

Home Page

Introduction

Culinary rhubarb is a member of the Polygonaceae (the buckwheat family). *Rheum rhaponticum* is a herbaceous perennial, the underground portion consists of fleshy and woody rhizomes and a fibrous root system. The petioles (stems) of the leaves are used for food. Botanically rhubarb is a vegetable but in its domestic use it is considered to be a fruit. It is a native of Central Asia. It was first grown for its root which was used for medicinal purposes (approximately 5000 years ago in China). It was grown in Europe in the 1700's but not until 1778 was it definitely recorded as a food plant. The large plant stalks resulted from the crossing of different species of rhubarb which were being grown for their roots (interspecies hybrid). By 1820 a method of forcing in the dark had been developed. It is sometimes called the "pie plant". Rhubarb plantings can remain productive for 5 to 7 years.

Rhubarb crown and rhizomes are resistant to cold and dry conditions. A dormant period does not seem to be essential. The vegetative parts of the plant are killed at -3°C. At relatively low temperatures stalks develop more red color while at higher temperatures green coloration is more prominent. It thrives best in regions having cool moist summers (day time highs under 25°C) and winters cold enough to freeze the ground to a depth of several centimetres. Forcing of rhubarb

cannot occur until dormancy is broken. Dormancy is broken by exposing crowns to a period of low temperatures. The duration of the low temperature depends on the cultivar. For forcing Gibberellic acid may be used to substitute for part of the "cold units". Cold units are calculated on a 10°C basis taken at a 10 cm depth at 9 am beginning on October 1st. All degrees below 10°C are noted each day to come up with an accumulated cold unit figure. Some cultivars require over 400 cold units before dormancy can be broken.

Rhubarb requires deep well drained sandy loam to loam soil with a good supply of organic matter. Heavy soils are satisfactory if they are well drained but the structure should be improved with manure or other forms of organic matter, also raised beds may be considered. Early field production requires light soils with a southerly exposure and a well sheltered field. Floating plastic mulches can be used to increase earliness by 10 to 14 days. Unheated greenhouses may also be used.

This vegetable crop is either field grown or forced inside sheds. Forced rhubarb is produced for the winter fresh market, field rhubarb is produced for the spring, early summer fresh markets, and the processing market (mainly frozen slices). Field yields depend on the vigor and age of the stand and range between 15,000 and 40,000 kg per hectare. Forced yields would be 15,000 - 20,000 kg per hectare of field root. (2 kg to 3 kg per root). Only the red stalked cultivars are suitable for fresh or forced rhubarb. These cultivars yield much less than green stalked cultivars. Some cultivars have high internal redness as well as a bright red stalk surface.

Presently rhubarb is grown in small quantities for the early fresh market and a sizable amount is grown for processing (frozen slices). Some markets exist for the forced product if it can be produced economically. This depends on the cost of capital facilities, crowns and labor as well as market volume. If demand increases from the substantial health related properties of rhubarb export markets could develop for fresh, processed and/or industrial products, eg. quality fiber, high potassium food, high red color (anthocyanin pigments).

Nutrient Content: Contains several nutrients including Vitamins A and C, thiamin, riboflavin, niacin, potassium and phosphorus. 250 mL (1 cup) raw rhubarb contains 20 kilocalories. 125 mL (cup) sweetened, cooked rhubarb has about 150 kilocalories. (Rhubarb is well known for its high quality fiber).

Crop Establishment ▲ to Top

Seeding/Planting - Rhubarb is not propagated from seed since seedlings are not true to type. Quality nursery stock for starting new plantings is recommended; this is due to freedom from virus, crown rots, root rots and weeds. Plants from tissue culture are vigorous and true to type. Otherwise, select vigorous, disease-free plants the summer before divisions are to be made and mark them with stakes. Dig the selected plants while they are dormant, either in the fall or early spring. Store in a cold place and protect from successive freezing and thawing, drying out and damage to buds. Close to planting time in the spring, cut each plant into as many divisions as possible - each with one or two well developed

buds and as large a piece of the adjacent root material as possible. Protect divisions from drying out before and during planting. Each parent plant will produce from 4 to 20 divisions depending on age and cultivar.

Rhubarb is normally planted as early as possible in the spring since growth begins when soil temperatures are still well below 10°C. Plants may be spaced 1 m by 1 m apart (10,000 divisions per hectare). Set divisions deep enough to cover the root piece. Planting on the square allows cultivation in two directions. In general higher plant populations result in increased yield per hectare but less yield per plant. To produce roots for forcing, spacing in the field may be adjusted to 75 cm between rows and plants (17,220 plants per hectare) without any loss of yield or quality.

Stock grown in greenhouse pots may be transplanted at any time during the growing season. Irrigation may be necessary.

Crop Management ▲ to Top

The first growing season - Plant only in fields that are as clean as possible from perennial weeds. Cultivation should be shallow and throughout the growing season. Some hand hoeing will be required, contact herbicides may be sprayed between the rows with the crop shielded. Flower stalks should be cut off as soon as they appear. One or two sidedressings of nitrogen may be necessary. No crop should be harvested the first season. In the fall well rotted manure and/or straw should be applied to the soil surface.

Following years - Cultivate occasionally to keep weeds in check but be careful not to cultivate too deep or close to the crown and fleshy roots.

For the fresh market a small two week harvest period may be made the second year if the previous season's growth was vigorous. Stalks should not be harvested until late in the season. The stalks are pulled from the crown during harvest, they are not usually cut. Generally harvest is not for more than 8 to 10 weeks during the third and future seasons. For processing crops a once over harvest is made in early to mid June. The stalks are cut close to the ground level and all stalks are removed. If heavy crops are removed from fields with poor root systems the root cannot build up enough carbohydrates for next year's production. These plants will then produce thin leaf stalks and low yields.

Flower stalks are removed when they show up in the field and before the flowers open. This helps keep plants vigorous.

Within 5 to 9 years of planting crowns often become rather crowded and produce small stalks. It is advisable either to replant the bed or reduce the number of buds on the crown by pruning.

Irrigate prior to harvest to increase crop yield and delay irrigation after harvest until plant injuries have healed. Straw may be applied in late fall or during the winter as a mulch to keep down weeds and ensure a cleaner harvest environment

from soil. A straw mulch may also be used to surface burn a field to control diseases and insects (especially potato stem borer).

Forcing Rhubarb - Plants are grown in the field for two years. Forced yields depends on the size of the root used for forcing. Dig plants just before the ground freezes solidly in the late fall taking as much root as practical. For late forcing, store plants in a cold place, and protect them from successive freezing and thawing, drying out and damage to buds. Severe freezing is injurious.

Gibberellic acid is useful in rhubarb forcing to assist in breaking dormancy to permit early production. This may allow time to force two crops in the house. Gibberellic acid also tends to increase yields.

Plants are forced in darkness, in structures where temperatures can be maintained at 11 to 13°C. At higher temperatures quality is poorer and at lower ones growth is slow. An earth floor is desirable. Place plants as close as possible (approximately 10 per square meter) and fill around the roots with soil or peat, leaving tips of buds uncovered. Water evenly and maintain a good water supply during forcing.

Adequate ventilation is needed to reduce humidity for the control of botrytis rot. Harvest normally starts about 4 weeks after forcing begins and extends 6 to 8 weeks. Stalks are usually harvested twice a week.

For continued production new beds should be started at intervals. The roots should be discarded after termination of the crop.

Early Field production - Clear plastic row covers will advance growth by two to three weeks when applied in early April.

Nutrition ▲ to Top

ALL ADDITIONS OF LIME AND FERTILIZER OR MANURES SHOULD BE BASED ON RECOMMENDATIONS FROM A SOIL TEST. WHEN TEST RESULTS ARE NOT AVAILABLE THE GENERAL REQUIREMENTS FROM TABLES 1 - 4 OF THE SOIL AND WATER MANAGEMENT SECTION OF THIS GUIDE MAY BE FOLLOWED.

Rhubarb grows well in a highly fertile soil high in organic matter and well drained. A green manure crop is desirable the year before planting. Also in the fall 45 tonnes of manure per hectare may be added. (An annual fall application of manure would be beneficial).

Lime - should be applied to maintain the soil pH in the range 6.0 to 6.8 (rhubarb will tolerate soil acidity as low as 5.0 but yields and fertilizer efficiency will suffer). As with all crops the calcium level should be 3000 kg/ha to be in line with current soil testing methods.

Nitrogen - rhubarb has a high requirement for nitrogen. Apply only as necessary

in the establishment year, otherwise apply nitrogen at bud break along with the phosphorus and potash requirements. Apply one or two sidedressings of nitrogen after harvest (delay until good regrowth has begun) or on crops to be used for forcing. Applications of manure will supply part of the nitrogen requirement of this crop.

Phosphorus - is most important in the establishment year. Fields selected for rhubarb should be high in phosphorus.

Potash - is only added if soil levels are not adequate but is usually required if high yields are being taken and manure is not being used.

Magnesium and/or Sulfur - may be needed on sandy soils low in organic matter. Foliar sprays of epsom salts or the use of gypsum and dolomitic limestone may be considered.

Micronutrients - boron may be necessary for the health of buds and roots. It may be applied in the fertilizer, as soil drenches and/or foliar sprays. Apply 1 to 2 kg per hectare per year of actual boron. Be careful not to burn foliage or roots in the establishment year.

Application method - broadcast N, P & K in the spring and apply manure in the fall. Sidedress or broadcast nitrogen or apply it through an irrigation system. Cultivation between the rows will mix some of the broadcast fertilizer into the soil and control some weeds.

Pests and Pest Control ▲ to Top

Weeds

Control weeds well before planting. Start cultivation early in the spring. Cultivation should be shallow to avoid injury to roots and can continue as late in the season as possible without damaging the plants.

Contact herbicides are registered for use but the crop must be well shielded.

Various types of mulch may be used between the plants and in the rows (most commonly straw).

Diseases

Leaf Spots - Ramularia and Ascochyta (fungi)

These fungi cause circular, or angular spots, variable in size having beige centers surrounded by a red zone. When affected tissue dies, it may drop out, leaving large ragged holes in the foliage. Fungi overwinter in infected plant debris and in infected propagation stock.

Control: Remove and destroy leaves following the first heavy frost. During

harvest, remove stems with spotted leaves first. Apply fungicide used for Botrytis control.

Botrytis Rot (fungus)

May cause a leaf, stem and crown rot of forced rhubarb. Disease intensifies where there is poor air circulation and high humidities.

Control: Practice strict sanitation. Apply recommended fungicide at first sign of disease and at 7 day intervals.

Root and Crown Rots (fungi & bacteria)

Characteristics: Plants become unthrifty. Leaves may turn yellow to red and collapse. The crowns, when sectioned, exhibit a brown-black decay. Large roots lack small feeder roots. Larger roots may have large brown-black lesions present.

Control: Purchase healthy propagation stock. Select well drained fields. Remove and destroy diseased plants.

Virus

Characteristics: Several viruses are known to occur in rhubarb. Reports from British Columbia and the U.K. indicate that turnip mosaic, arabis mosaic and cherry leaf roll virus are the most common. These viruses have wide host ranges and cause mottling and ring spotting of leaves. They may be introduced in infected planting stock.

Control: Obtain and plant healthy nursery stock. Avoid planting virus free crowns near virus contaminated crowns.

Insects

Potato Stem Borer

Characteristics: The potato stem borer is a caterpillar, which when fully grown is about 3.5 cm in length and pinkish-white in colour. The first stages of the insect attack only weeds, couch grass in particular. Later they move into plants with thicker stems, such as rhubarb. They may move from stem to stem, boring into the centre of the stalk. The adult moths lay their eggs on the stems of grasses in August. The eggs do not hatch until the following spring. Damage can be expected in June and early July. Serious infestation can lead to an unmarketable crop.

Control: This pest is not a problem when couch grass and other weeds are controlled in and around the rhubarb plantation. Weeds should be controlled to make the field less attractive for egg laying by the adult moth. Early spring burning of affected fields or field margins will effectively control this pest.

Tarnished plant bug

Characteristics: Adult tarnished plant bugs are light brown to reddish brown in colour and about 5-6 mm in length. They occur throughout the season. They are very active and quick moving. They can damage rhubarb by feeding on young leaves. They pierce the stalk with their mouthparts and cause wilting and distortion of the leaves. Tarnished plant bugs are mainly a pest of new plantings.

Control: Keep plantings and adjacent areas weed free. Avoid planting adjacent to legumes.

Slugs

Characteristics: Slugs may be a problem in plantings with heavy soils, poor drainage and in weedy situations. Slugs fed at night, by rasping the surface of stems, leaving unsightly scars, which reduce the saleability of the stem.

Prevention: Provide good soil drainage. Keep weeds under control. Remove leaves and trash from the field when harvesting. Do not use manure and/or mulches in areas of field prone to slug damage.

Other Insect Pests

Black bean aphid *Aphis fabae* has caused problems on occasion. Large infestations may cause curling or wilting of leaves. There is also potential for the spread of virus by aphids.

Flea beetles can cause damage to new plantings by their feeding activity on the leaves. They are especially active during periods of hot dry weather.

Control: Provide good weed control. There are no products registered for either of these pests.

SPECIFIC CHEMICAL CONTROLS FOR THE VARIOUS CROP PESTS DISCUSSED MAY BE FOUND IN THE SUPPLEMENT TO THIS GUIDE, A.P.A.S.C.C. PUBLICATION 1400A, "GUIDE TO PEST MANAGEMENT" FOR VEGETABLE CROPS.

Harvesting and Handling ▲ to Top

Rhubarb stalks should be pulled rather than cut for fresh market. Some of the leaf web may be left to keep stalks from splitting or "brooming". For the processing market rhubarb is cut at the soil line. Do not cut during rain or wet weather as splitting or "brooming" will occur in the containers. Do not harvest the first year. A small harvest may be made the second year if growth has been good (on certain cultivars). In the third and subsequent years, the harvest season can be extended to 8 to 10 weeks if stalks are of satisfactory size. Harvest can be longer than this if the planting is to be abandoned. When harvested too late stalks become pithy and tough.

Storage and Conditioning

Store only fresh stalks in good condition. Rhubarb can be hydrocooled or forced-air cooled following harvest. Store at a temperature of 0°C, and a relative humidity of 95 to 100%. Stalks can be held 2 to 4 weeks under these conditions. Provide ample air circulation on all sides to prevent heating.

Research has shown that decay of cut pieces can be reduced and shelf-life increased by dipping whole stalks in 52°C water for 2 minutes prior to cutting and packaging.

Bibliography ▲ to Top

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▲ to Top

PEST	PESTICIDE (Formulation)	RATE Product	DAYS TO HARVEST	REMARKS

Weeds

▲ to Top

Preplant Perennial Weeds including quackgrass	ROUNDUP 356 Sn	2.5 to 7.0 L/ha	-	Apply in the fall or spring prior to planting. Annual weed control programs will be necessary to control weeds germinating after planting. For quackgrass control apply to actively growing quackgrass when at least 4 new leaves are present. The low rate (2.5 L/ha) will provide a minimum of one season control, while higher rates (4.75 to 7 L/ha) will provide longer term control. The low rate of Roundup should be applied in 50 to 100 L/ha water. If higher water volumes are used add a suitable surfactant. Wait 72 hours before plowing under. (Establishment year fields only). Best control of quackgrass is obtained when these herbicides are applied in the fall.
	TOUCHDOWN 480	2.5 to 7.0 L/ha	-	
	GLYFOS	2.5 to 7.0 L/ha	-	
	ROUNDUP TRANSORB	2.5 to 7.0 L/ha	-	
Postemergence Inter-row shielded	GRAMOXONE 200 Sn	2.75 to 5.5 L/ha	-	Do not spray solution on the crop plant since it could be injured or killed. Use Gramoxone for best control of grasses.
	REGLONE 200 Sn	2.75 to 5.5 L/ha	-	

Insects

▲ to Top

Potato stem borer	NO MATERIAL REGISTERED	-	-	Control weeds. (Especially couchgrass). Burn grass in weedy areas in early spring within and around field margins.

Diseases

▲ to Top

Botrytis leaf rot (forcing sheds)	CAPTAN 50 WP	2.25 kg/1000 L	2	Spray at weekly intervals.
	CAPTAN 80 WP	1.4 to 2.0 kg/1000 L	2	
	MAESTRO 80 DF	1.25 to 2.0 kg/ 1000 L	2	Spray at weekly intervals. Do not reenter treated areas within 48 hours of application.